MICROFILM PROJECTOR APPARATUS

This invention relates to microfilm projection equipment and more particularly to an improved, highly efficient means for projecting microfilm images in a shrouded convenient viewing position from a fully concealed projector and featuring a single control for regulating film feed and speed in either direction.

Prior microfilm-exhibiting equipment is subject to numerous shortcomings and disadvantages from mechanical, functional and esthetic viewpoints. Desirably, the equipment should be usable with high efficiency in well-lighted rooms such as those found in properly illuminated public library reading rooms. My copending application for U.S. Letters Pat., Ser. No. 710,110 filed Mar. 4, 1968 for Microfilm Display Apparatus overcomes serious objections to prior display equipment but is subject to certain minor objections fully obviated by the present invention. In this prior construction, the projector is partially exposed in a recess at one end of the counter or writing surface. This arrangement interferes objectionably by restricting the available writing space and, under certain conditions, movements of the operator intercept the light beam from the projector thereby blocking the projection beam and causing sharply contrasting changes in illumination of the surface being viewed by the user.

The present invention provides improved display equipment of the same general type as that disclosed in my aforementioned copending application, but eliminating certain inconveniences and disadvantages deemed by some users as present in the earlier disclosure.

In the present invention the image display surface is flush with a conveniently arranged counter top providing a large, unobstructed writing surface conveniently located on either side of the display surface. The projector itself is concealed from view and located centrally beneath the display surface, the light beam from the projector passing upwardly through a transparent section of the display surface onto an overhead reflecting device and thence back onto the viewing surface. Only the controls are exposed to view, one of these serving to rotate the projector to orient the image and the other being shiftable in either direction in variable amounts as requisite to regulate the direction and speed of the motor driving the film feed. Access to the projector is obtained by lifting the image display plate, whereupon the projector as a unit is removable from a rotary turntable by means of which the projector is rotatable about the axis of its light beam. The reflecting mirror is also adjustable at the user's option to vary the magnification of the image as well as to shift it forward or backward on the viewing surface for greater visibility and convenience in reading the same. Another expedient permits the user to focus the projector accurately by lifting a part of the viewing surface to gain access to the focusing control while using another part of the image display surface to adjust the focus control.

Owing to the arrangement of the projector and viewing surface in close proximity to but below the writing surface, the designer is enabled to resort to a wide range of housing designs and to achieve maximum esthetic effects without restriction or need of expedients to conceal mechanical equipment.

Accordingly, it is a primary object of this invention to provide an improved, simple, easily operated, highly efficient microfilm viewing apparatus substantially all components of which are concealed from view.

Another object of the invention is the provision of a microfilm-viewing apparatus having the appearance of an article of furniture and having a reading and writing surface flush with an image display surface serving additionally to conceal an underlying projector arranged to project the image through the viewing surface before being reflected back thereonto.

Another object of the invention is the provision of microfilm-viewing apparatus designed as a pleasing article of furniture and featuring a reading and writing surface within a light-shielding shroud and having a projector unit rotatable about its own axis beneath the table top onto which the image is cast by reflector means.

Another object of the invention is the provision of a microfilm reader having a projector supported for bodily rotation about the axis of its light beam.

Another object of the invention is the provision of a microfilm reader having a display surface between selectably usable writing surfaces at tabletop level and on generally the same plane as the viewing surface.

Another object of the invention is the provision of a microfilm reader having an image display surface generally normal to the image projection beam and located closely adjacent the forward end of the projection lens system.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated:

FIG. 1 is a perspective view of an illustrative embodiment of the invention;

FIG. 2 is a fragmentary, vertical sectional view taken along line 2—2 on FIG. 1;

FIG. 3 is a fragmentary sectional view taken along line 3—3 on FIG. 2; and

FIG. 4 is an enlarged fragmentary vertical sectional view taken generally along the projection axis of the projector.

Referring more particularly and initially to FIG. 1, there is shown a typical embodiment of the present invention designated generally **10**. This view shows as esthetically pleasing housing **11** suitable as a piece of furniture and designed to harmonize pleasingly with other furnishings commonly found in offices, drawing rooms, public reading rooms and the like, and provided with a counter or reading surface **12** supported between upright end walls **13**, **13**, rear wall **14**, and a top wall **15**. A center panel **18** of any suitable material is hinged at **19** to the rear wall of the cabinet an its surface is treated to provide an image-receiving and reflecting surface. The portion of counter **12** to either side of the image-reflecting panel **18** is preferably sufficiently large to provide a writing surface of ample size for either a left- or right-handed user. The only portion of panel **18** which is not treated to provide an image-reflecting surface is a small diameter circle **22** directly overlying the projector and through which the image-conveying light beam passes. If desired, this circle may comprise an opening through the panel but, preferably, clear glass covers the objective lens of the projector and serves to guard the lens from dirt and foreign matter.

Underlying hinged panel **18** is a supporting framework or housing **25** for supporting and housing the projector proper designated generally **26**. Housing **25** is provided with a large diameter opening **27** in its bottom equipped with an antifriction bearing assembly **28**, the upper ring of which nests snugly about a shoulder **29** formed on projector main frame **30**. The axis of bearing ring **28** is normal to panel **18** and coincides with the projection axis of projector **26**. In consequence, it will be recognized that the projector may be rotated as a unit at least through 90° in either direction from its normal operating position for the purpose of orienting the image in a convenient reading position on panel **18**. Thus, a drawing, photograph, table or other matter on the film arranged lengthwise of the filmstrip can be rotated so that its image extends crosswise of the viewer on panel **18**.

To facilitate rotation of the projector, its lamp housing **32** is shown as equipped with a toothed ring **33** which mates with teeth **34** formed about the inner rim edge of an adjusting ring **35**. This latter ring is supported on rollers mounted in brackets **36** secured to housing **11** beneath panel **18**. Rim **37** of ring **35** projects through a slotlike opening **38** formed in flange **39** projecting downwardly from the forward edge of counter **12**. It will be understood that adjusting ring **35** remains seated on the rollers in brackets **36** at all times but permits upward withdrawal of projector **26** from the antifriction bearing assembly **28** whenever the projector is in need of servicing.